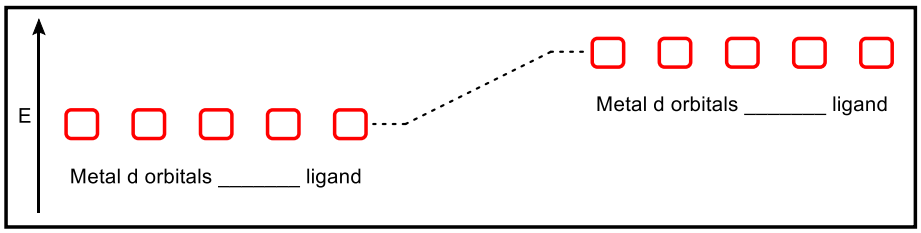
CONCEPT: INTRO TO CRYSTAL FIELD THEORY

- Transition metal coordination compounds form crystalline solids.
- Crystal field theory was developed to explain _____ and _____ properties of coordination compounds.
  - □ Focuses on the effects of ligands' electric field around the metal cation.

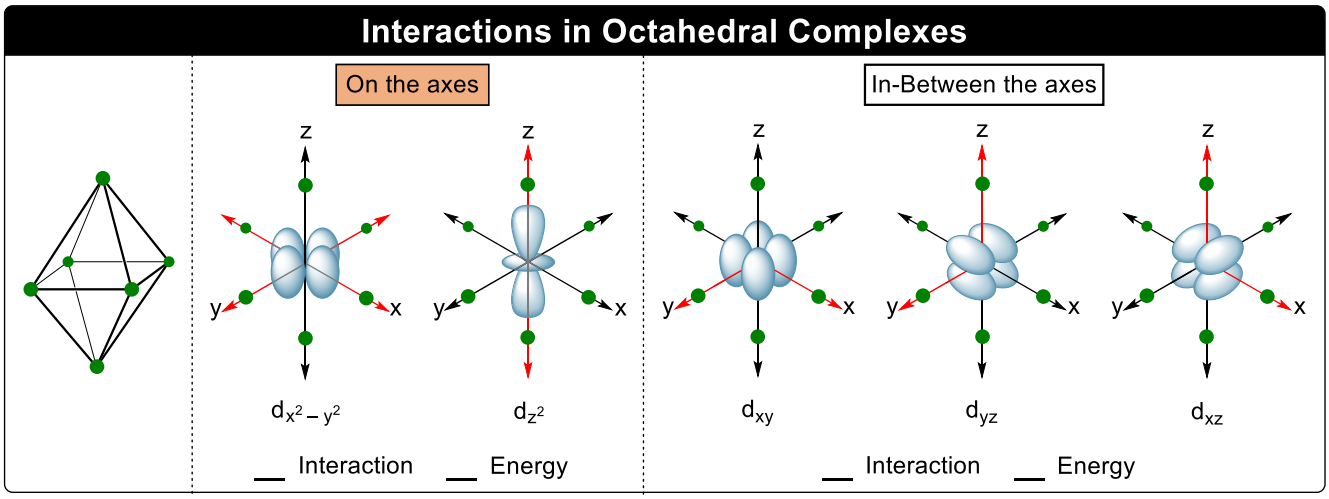
Ligand–Orbital Interactions

- The interaction between the ligand and the metal cation is _____.
  - □ Increases the _____ of metal d orbitals: ____ interaction = ____ energy



Interactions in Octahedral Complexes

- The strength of ligand-orbital interaction depends on complex _____ and d orbital _____.
- Octahedral complexes: ligands are on the axes.
  - □ **On the axes** orbitals have the _____ interactions with the ligands.



EXAMPLE: Which set of d orbitals below will interact the most with the NH_3 ligands in $[Fe(NH_3)_6]Cl_3$?

a) d_{xy}, d_{yz}, d_{xz}

b) d_{xy}, d_{yz}, $d_{x^2-y^2}$

c) d_{xz}, d_{yz}, d_{z^2}

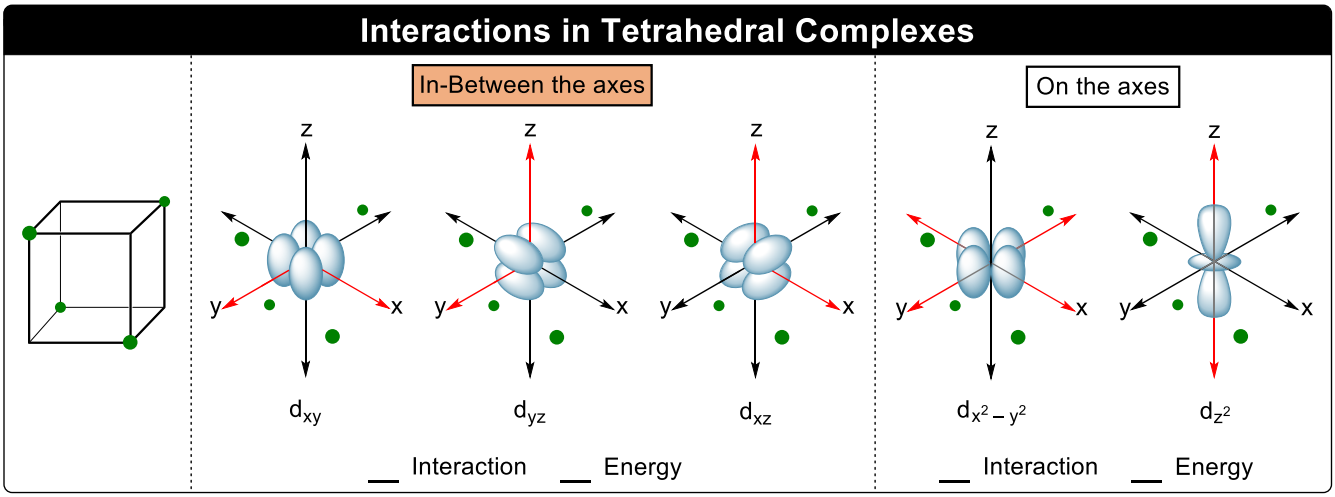
d) d_{xy}, $d_{x^2-y^2}$, d_{z^2}

e) $d_{x^2-y^2}$, d_{z^2}

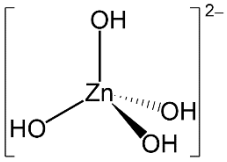
CONCEPT: INTRO TO CRYSTAL FIELD THEORY

Interactions in Tetrahedral Complexes

- Tetrahedral complexes: ligands are aligned _____ the axes.
  - □ **In-between the axes** orbitals have the _____ interactions with the ligands.



EXAMPLE: Identify the d orbital(s) with the highest energy in the complex shown below?



a) d_{xy} b) d_{yz} c) d_{xz} d) d_{z^2} e) $d_{x^2-y^2}$ f) both d and e g) a, b, and c

PRACTICE: For an octahedral complex, which set of d orbitals is expected to be at the lowest energy?

a) d_{xy}, d_{yz}, d_{z^2}

b) d_{yz}, d_{xz}, d_{z^2}

c) d_{xy}, d_{yz}, d_{xz}

d) d_{xy}, d_{yz}, $d_{x^2-y^2}$

e) d_{yz}, $d_{x^2-y^2}$, d_{z^2}